

Development of a high performance ammonia removal system by using a novel marine bacterium

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Summary

Ammonia is a toxic and fouling gas. Therefore, ammonia removal from several environments, such as exhaust gas from fertilizer plants or garbage composting plants, is important. So far, several biodeodorization treatments to remove ammonia have been reported. Although autotrophic bacteria have been often used to construct ammonia removal system, it is difficult to prevent the contamination of other organisms as the growth rate is very slow compared with general heterotrophic bacteria. Low growth rate reveals low ammonia removal capacity or rate. Furthermore, contamination of other organisms results in the lowered ammonia removal performance of the system. Therefore, in this study, we propose a novel system to remove ammonia using *Vibrio alginolyticus* Oiso-1, which is a heterotrophic and halophilic bacterium. This strain grows fast and reveals high salt-tolerance compared with general microorganisms. Therefore, using this strain leads to decrease the risk of contamination and increase ammonia removal capacity. In this work, using ammonia gas as a nitrogen source, two ammonia removal systems are proposed. One is a bubbling system and another is a biofilter system. The former system was constructed with 300 ml of Oiso-1 liquid culture in which ammonia gas was aerated. The complete ammonia removal ratio (100% ammonia removal period) was achieved for 10.7, 8.1, and 3.6 days in case of 500, 1000, and 2000 ppm of ammonia loading, respectively. The latter system was constructed with glass column and inorganic carrier (fuyolite) containing Oiso-1. This system is generally called a biofilter. More than 80% of ammonia was removed when various concentrations of ammonia (200-1200 ppm) were loaded during 61 days. From this result, maximum and complete ammonia removal capacities were estimated to be 22.8 and 18.6 g-N/kg-dry-fuyolite/day, respectively. These data were higher than any other reported data and revealed that ammonia removal method by using Oiso-1 might be a promising method. It is important to clarify the ammonia removal mechanism as a future work.